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IS 1901 (1978): Visual indicator lamps [ETD 23: Electric Lamps and their Auxiliaries]



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IS : 1901 - 1978
(Reaffirmed 1987)

Indian Standard
SPECIFICATION FOR
VISUAL INDICATOR LAMPS
(*First Revision*)

Second Reprint FEBRUARY 1999

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002



AMENDMENT NO. 1 AUGUST 1986

TO

IS : 1901 - 1978 SPECIFICATION FOR VISUAL INDICATOR LAMPS

(First Revision)

(Page 9, Table 2, col 3, third entry) — Substitute 'with one' for 'without'.

(Page 9, clause 3.1.4.3) — Add the following in the end:

'The adherence of the connecting plates shall be checked by inserting and removing the lamps in a lamp jack. There shall be no sign of loosening of the connecting plates.'

(Page 10, Table 4, col 5 and 6, third row) — Substitute '2.4' and '1.9' for '1.0' and '0.8' respectively.

(Page 11, Table 5) — Substitute the following for the existing table.

TABLE 5 LIFE TEST VOLTAGES

(Clause 3.3.1)

RATED VOLTAGE	LIFE TEST VOLTAGE
(1)	(2)
V	V
4	4.2
6	6.3
12	12.6
17	17.85
24	25.2
40	42.0
50	52.5

(Page 11, clause 3.3.1.1) — Substitute the following for the existing clause:

'3.3.1.1 The average life shall not be less than 1 000 hours subject to the following allowances:

*Number of Lamps
in Life Test*

**Percentage Allowances
in Average Life*

13
20
32
50

8
7
6
5

(Page 15, clause 7.3.3) — Add the following Appendix after this clause:

' APPENDIX A

(Clauses 4.1.3 and 7.3)

SAMPLING PROCEDURE AND CRITERIA FOR CONFORMITY

A-1. BATCH

A-1.1 The number of lamps to be selected from each batch shall depend upon the size of the batch and shall be in accordance with col 1 and 2 of Table 6. All the lamps selected from the batch for testing shall be divided into two equal sets. First set shall be utilized for inspection test, rating test and life test and the second set shall be utilized for testing for fragility of filaments.

A-1.2 These lamps shall be selected from the batch at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968 'Methods for random sampling', may be followed.

A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 Visual Examination and Checking for Mechanical, Physical and Marking Requirements — The first set of inspection quantity (ITQ) shall be selected in accordance with col 3 of Table 6. All these lamps shall be tested for visual examination, mechanical, physical and marking requirements. The lot shall be considered as conforming to the requirements of these tests if the following conditions are satisfied:

- a) The number of failure for any single requirements is less than or equal to the corresponding acceptance number given in col 4 of Table 6, and
- b) The number of failures for all requirements taken together is less than or equal to the corresponding acceptance number given in col 5 of Table 6.

A-2.2 Initial Rating Test — The lot which has been found as conforming to the above requirements shall then be tested for initial ratings. The number of lamps to be selected for this purpose shall be in accordance with col 1 and 6 of Table 6. The lot shall be considered as conforming to the initial rating requirements of 3.2, if the following conditions are satisfied:

- a) The average initial current falls within the limits specified in Table 4,

- b) The average initial lumens is equal or more than the minimum limits specified in Table 4, and
- c) The coefficient of variation of initial lumens is equal to or less than the value specified in Table 4.

A-2.3 Life Performance Test — The lot which has been found as conforming to the rating test requirements shall then be tested for life performance requirements. For this purpose, the sample size shall be in accordance with col 1 and 7 of Table 6. The lot shall be considered as complying with the life performance requirements (*see* 3.3) if the following conditions are satisfied:

- a) The average life of the life test quantity attains value specified in 3.3.1 subject to the allowance given in 3.3.1.1.
- b) The total number of lamps having lives shorter than 700 h together with those failing to pass the requirements of luminous flux at 500 h for individual lamps (*see* 3.3.2), is less than or equal to the corresponding acceptance number given in col 8 of Table 6.

A-2.4 Fragility of Filaments — The second set of samples selected in accordance with col 1 and 9 of Table 6 shall be used for this test. The lot shall be considered as conforming to the requirements of this test, if the total number of failures are less than or equal to the corresponding acceptance number given in col 10 of Table 6.

A-2.5 The lot shall be considered as conforming to the requirements of this standard if A-2.1, A-2.2, A-2.3 and A-2.4 are satisfied.'

TABLE 6 SAMPLE SIZE AND ACCEPTANCE NUMBER

(Clauses A-1.2, A-2.1.1, A-2.1.2, A-2.2 and A-2.3)

Lot Size	ITQ	FOR VISUAL, MECHANICAL PHYSICAL REQUIREMENTS AND MARKING			RTQ	LTQ	ACCEPTANCE NUMBER	FOR FRAGILITY OF FILAMENTS	
		Sample Size	Acceptance Number of Single Require- ments Taken together	Acceptance Number				Sample Size	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Up to 1 000	64	32	2	5	20	13	2	32	2
1 001 " 3 000	100	50	3	7	32	13	2	50	3
3 001 " 10 000	160	80	5	10	50	20	3	80	5
10 001 " 35 000	250	125	7	14	80	32	5	125	7
35 001 and above	400	200	10	21	125	50	7	200	10

(ETDC 23)

Indian Standard

SPECIFICATION FOR VISUAL INDICATOR LAMPS

(*First Revision*)

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(*Continued on page 2*)

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(Continued from page 1)

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Indian Standard
**SPECIFICATION FOR
VISUAL INDICATOR LAMPS**
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 26 September 1978, after the draft finalized by the Electric Lamps and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 The electric lamps detailed in this standard are normally used in the telegraph and telephone switch boards. However, these types of lamps are in increasing use in power-line communication equipment used by the Electricity Board, in electricity control and indicating panels, etc; and a national standard specification would be a very useful guide for all users and also for manufacturers.

0.3 This standard was first published in 1961. This revision has been undertaken with a view to upgrade many of the essential characteristics and requirements of the visual indicator lamps that have taken place since the first publication of the standard.

0.4 In the preparation of this standard, assistance has been derived from the following publications:

ITD No. S/ZL — 100B Specification for visual indicator lamps.
Indian Posts and Telegraphs Department.

BS 1050 : 1953 Visual indicator lamps. British Standards Institution.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard lays down the requirements and methods of test for electric lamps used as visual indicators in telephone and telegraph switch boards and for allied purposes.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 1885 (Part XVI/Sec 3)-1976* shall apply.

2.1 Type — Lamps of the same general construction, which are intended to be identical in photometric and electrical ratings.

2.2 Batch — All lamps of one type put forward in a lot at one time for acceptance or all the lamps of one type which are subjected, on one occasion, to tests for compliance with this standard.

2.3 Test Quantities

2.3.1 Inspection Test Quantity (ITQ) — The number of lamps selected for the purpose of determining the acceptability of a batch as to mechanical and physical and marking requirements specified in 3.1 and 5 and also the requirements of fragility of filaments specified in 6.1.1.

2.3.2 Rating Test Quantity (RTQ) — The number of lamps selected from a batch according to an agreed method the initial rating tests on which shall determine whether or not the batch complies with the initial rating requirements specified in 3.2.

2.3.3 Life Test Quantity (LTQ) — The number of lamps selected from a batch according to an agreed method, the life test and measurements for lumen maintenance on which shall determine whether or not the batch complies with the life performance requirements specified in 3.3.

2.4 Lumen — The unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

NOTE — The candela (abbreviation: cd) is the unit of luminous intensity. It is of magnitude such that the luminous of a full radiator at the temperature of solidification of platinum is 60 units of luminous intensity per square centimetre.

2.5 Initial Readings — The photometric and electrical measurements made at the end of the ageing period.

2.6 Life of a Lamp — The number of hours a lamp operates to burn out or to arrive at some specified change in light output.

*Electrotechnical vocabulary: Part XVI Lighting, Section 3. Lamps and auxiliary apparatus.

2.6.1 Average Life — The arithmetic mean of the lives of the lamps in a life test quantity.

2.6.2 Specified Life — The life of a lamp in hours given in 3.3.

2.7 Rated Voltage — The voltage marked on the lamp.

2.8 Life Test Voltage — The voltage at which the life tests are made, which is in excess of the rated voltage, in order to limit the duration of the life test.

2.9 Lumen Maintenance of an Individual Lamp — The lumen output after 50 percent of the specified life, expressed as a percentage of actual initial lumens.

2.10 Average Lumen Maintenance (of Any Test Quantity) — The mean of the values of lumen maintenance for the individual lamps.

2.11 Standard Deviation (of a Group of Measurements) — The square root of the number obtained by adding the squares of the differences between the individual measurements and the average of the group, and dividing the sum by the number of measurements,

2.12 Coefficient of Variation (of a Group of Measurements) — The standard deviation expressed as a percentage of the average of the group of measurements.

3. REQUIREMENTS

3.1 Mechanical and Physical Requirements

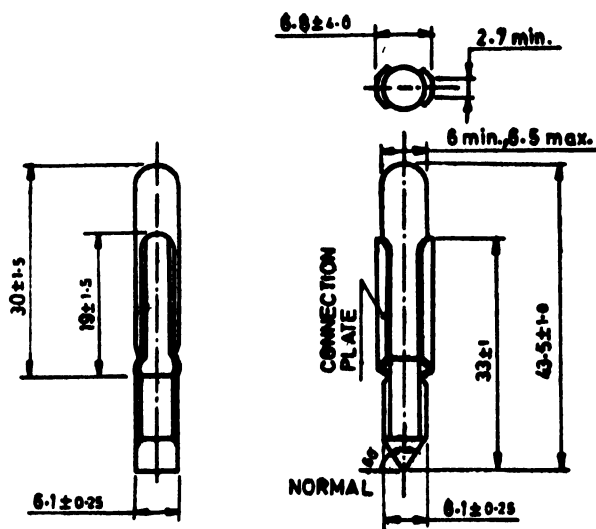
3.1.1 Dimensional Requirements of the Lamp — The dimensions of the lamps shall be in accordance with Fig. 1. All lamps shall pass easily by their own weight through a smooth-bored tube having an internal diameter of 7.9 mm and a length of 50 mm when inserted by their cap end. The bulb shall not enter smooth bored tubes having an internal diameter of 6.2 mm.

3.1.1.1 The overall length of the lamp shall be checked with the gauge shown in Fig. 2.

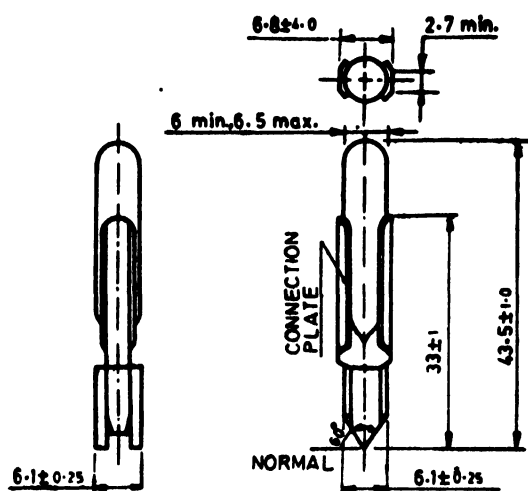
3.1.1.2 Typical shapes of lamps covered by this standard are given in Fig. 1A, 1B, 1C and 1D.

3.1.2 Bulbs — The bulb shall be clear, uncoloured and free from defects.

3.1.3 Filaments — The filament shall be of tungsten and shall have rated voltages as specified in Table 1.



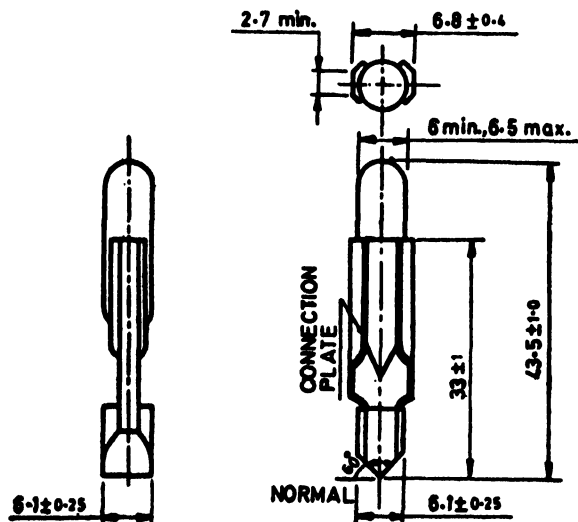
1A



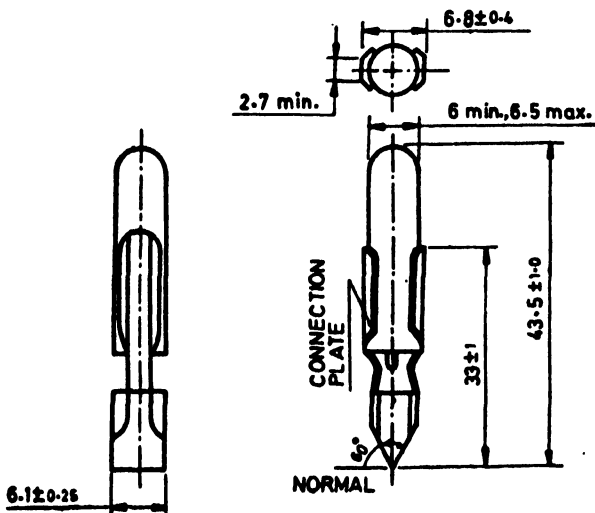
1B

All dimensions in millimetres.

FIG. 1 TYPICAL SHAPES OF VISUAL INDICATOR LAMP — *Contd*



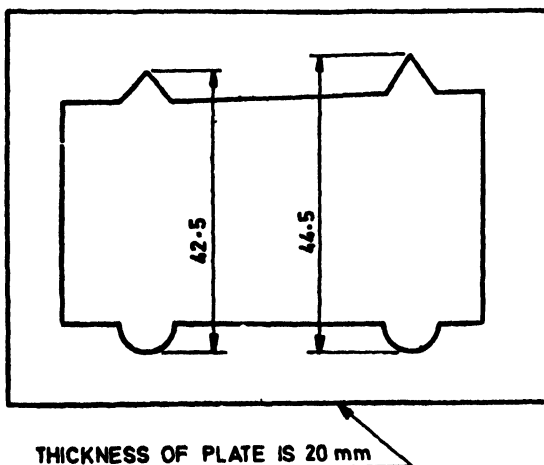
1C



1D

All dimensions in millimetres.

FIG. 1 TYPICAL SHAPES OF VISUAL INDICATOR LAMP



All dimensions in millimetres.

FIG. 2 GAUGE FOR CHECKING OVERALL LENGTH

TABLE 1 RATED VOLTAGES OF FILAMENTS

(Clause 3.1.3)

TYPE OF FILAMENT (1)	RATED VOLTAGE (2)
Tungsten	V
	4
	6
	12
	17
	24
	40
	50

3.1.3.1 The filament shall be closely coiled and shall be adequately supported. Particulars of filaments and the supports desired are given in Table 2.

3.1.3.2 All coiled portions of the filaments un-influenced by contact with support shall appear uniform (or glow uniform) when energized at half the rated voltage. In no case shall the filament touch side of the bulb.

3.1.3.3 *Fragility of filament* — The filament shall be so constructed and mounted in the lamp that the lamp shall satisfactorily pass the test for fragility of filament (see 6.1.1), after minimum one hour ageing at the rated voltage.

TABLE 2 PARTICULARS OF TUNGSTEN FILAMENTS AND SUPPORTS

(Clause 3.1.3.1)			
VOLTAGE OF LAMP	TYPE OF COIL	NUMBER OF SUPPORTS	REMARKS
(1) V	(2)	(3)	(4)
4	Single coil	Without intermediate supports	—
6	Single coil	Without intermediate supports	The top portion of the filament shall be situated within 5 mm from the top of the bulb
12	Single coil	Without intermediate supports	—
17	Single coil	With intermediate supports	—
24	Single coil	With intermediate supports	—
40	Single coil	With intermediate supports	—
50	Single coil	With intermediate supports	—

3.1.4 Connection Plates

3.1.4.1 The connection plates shall be of brass, nickel plated. The surface of contact shall be flat to secure them tightly in the jack springs to prevent the rotation of the lamp in the jack.

3.1.4.2 The dimensions and fittings shall be such that it is impossible to short-circuit the two connection plates by means of a flat metal surface; the flats shall be as far as possible in alignment with the flats of the end pieces. The soldering shall be effected in such a manner that the contact surfaces remain clean.

3.1.4.3 The connection plates shall be diametrically secured to the bulb by means of suitable cement. The tails of the connection plates shall be securely anchored. The connection plates shall be capable of standing a temperature of 80°C for 20 minutes without showing any sign of loosening.

3.1.5 The end pieces shall be of hard, self-coloured, heat-resisting moulding material. The surface, to distinguish the rated voltages of the lamps, shall be of a colour as indicated in Table 3. The end pieces shall be in alignment with the bulbs to comply with 3.1.1 and the surfaces shall be smooth and true.

TABLE 3 COLOUR OF END PIECES

(Clause 3.1.5)

VOLTAGE (1) V	COLOUR OF END PIECE (2)
4	Green
6	Grey
12	Red and yellow mottle
17	Orange
24	Yellow
40	Blue and white mottle
50	Brown

3.2 Initial Rating Requirements

3.2.1 Initial Ratings—The initial current and the average initial lumens of the rating test quantity at the rated voltage, shall be as specified in Table 4.

3.2.1.1 Coefficient of variation of initial lumens shall not exceed the values specified in Table 4.

3.2.1.2 Initial rating measurements shall be made only after an ageing period of approximately one hour at rated voltage.

TABLE 4 INITIAL RATINGS

(Clauses 3.2.1, 3.2.1.1, 6.3.1 and 7.3.2)

RATED VOLTAGE	AVERAGE INITIAL RATING AT RATED VOLTAGE					COEFFICIENT OF VARIATION OF INITIAL LUMENS
	Current			Lumen		
	<i>Rated</i>	<i>Max</i>	<i>Min</i>	<i>Rated</i>	<i>Min</i>	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
V	A	A	A			percent
4	0.250	0.270	0.230	3.7	3.0	20
6	0.041	0.045	0.037	0.7	0.55	20
12	0.100	0.108	0.093	1.0	0.8	20
17	0.045	0.055	0.041	1.8	1.4	20
24	0.100	0.108	0.093	6.0	4.8	20
40	0.075	0.080	0.070	7.5	6.0	20
50	0.100	0.108	0.093	12.5	10.0	20

3.3 Life Performance and Lumen Maintenance Requirements — The average life, individual lamp life and the luminous flux of individual lamp at 500 hours shall comply with the requirements specified in 3.3.1 and 3.3.2.

3.3.1 The average life, when tested at life test voltages specified in Table 5, shall not be less than 1 000 hours.

TABLE 5 LIFE TEST VOLTAGES

RATED VOLTAGE	LIFE TEST VOLTAGE
(1)	(2)
V	V
4	4.5
6	7.0
12	13.0
17	18.5
24	26.0
40	42.0
50	52.0

3.3.1.1 The average life may be below the specified life by not more than 8 percent. This figure is the statistical allowance to take into account the relatively small size of the sample taken for life test.

3.3.2 Individual Lamp Requirement — A lamp shall have the following requirements:

- a) A life of not less than 700 hours [see 7.3.2 (b)], and
- b) A ratio of the luminous flux at 500 hours to the initial luminous flux expressed as a percentage which shall not be less than 85.

NOTE — If a lamp does not comply with (b) above, it shall only be credited with a life proportional to the specified lumen maintenance, that is:

$$\text{Credited life} = \frac{1\,000 \times (100 - \text{specified lumen maintenance percent})}{100 - \text{actual lumen maintenance percent}}$$

3.4 Package — The lamps shall be packed in cardboard cells enclosed within a cardboard box or other approved packing. Each full box shall contain hundred lamps.

4. SELECTION OF LAMPS FOR TEST

4.1 General — Samples for testing shall be selected from lamps belonging to one batch.

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4.2 Inspection Test Quantity — Inspection test quantity shall consist of an integral number of lamps not less than $2 \times \sqrt{N}$ lamps, where N represents the number of lamps in the batch (with a maximum batch size of 5 000 lamps), with a minimum of 60 lamps.

4.2.1 The samples shall be taken for test in approximately equal quantities from at least ten evenly selected boxes, or from all if a batch comprises less than ten boxes, so that no undue proportion is taken from any one portion of the batch.

4.2.2 The total number of lamps selected shall be divided into two equal sets, first set being utilized for inspection tests, rating tests and life tests and the second set being utilized for test for fragility of filaments.

4.3 Rating Test Quantity — Rating test quantity shall consist of an integral number of lamps not less than $\sqrt{N}$ lamps, where N represents the number of lamps in the batch (with a maximum batch size of 5 000 lamps) with a minimum of 25 lamps. The RTQ shall be selected evenly from the ITQ.

4.4 Life Test Quantity — The samples for the life test quantity shall be selected evenly from the rating test quantity and shall be 25 in numbers.

5. MARKING

5.1 Each lamp shall be marked with the following:

- a) Manufacturer's identification mark,
- b) Rated voltage,
- c) Year of manufacture, and
- d) Country of manufacture.

NOTE 1 — The marking shall be embossed on the connection plates.

NOTE 2 — If the space on the lamp is not sufficient, then the year of manufacture and the country of manufacture may be marked on the carton along with other information, if any.

5.2 The product may also be marked with Standard mark.

5.3 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6. TESTS

6.1 Visual Examination and Checking for Physical and Mechanical Requirements — Each lamp of the first set of ITQ shall be examined visually as well as checked for physical and mechanical requirements detailed in 3.1 (excepting test for fragility of filaments) and 5.

6.1.1 Fragility of Filament — Each lamp of the second set of ITQ should be first checked for continuity of the filament and the broken glass part. The lamp with broken glass part shall be replaced. Then the lamps shall be allowed to slide, with the bulb first, under its own weight, down a copper tube arranged as shown in Fig. 3. The lamps shall be inspected for broken filament.

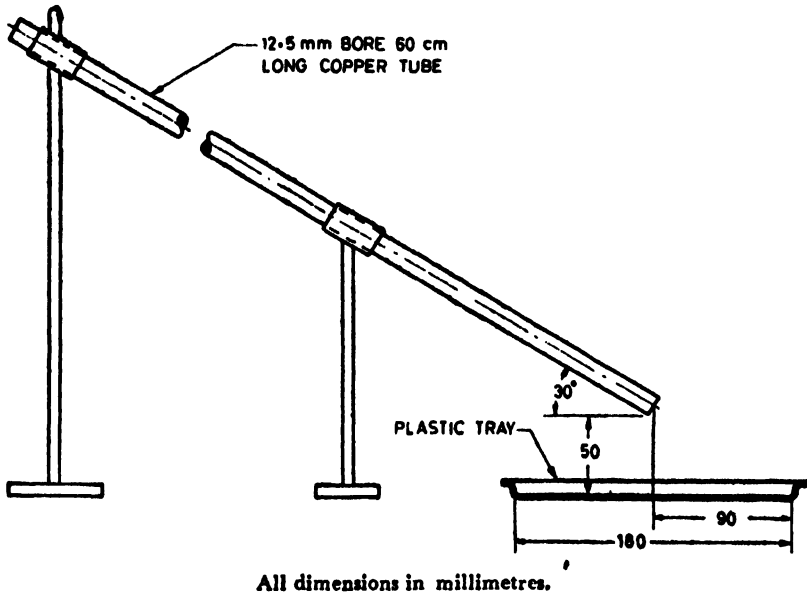


FIG. 3 ARRANGEMENT FOR TEST FOR FRAGILITY OF FILAMENTS

6.2 Package of Lamps — Each package shall be examined for conformity with 3.4.

6.3 Initial Rating Test — The lamps selected for rating test as in 4.3 shall be aged at the rated voltage for one hour and the measurements shall then be made for initial current and initial lumens at the rated voltage.

6.3.1 The initial current, average initial lumen and the coefficient of variation of initial lumens shall conform to the values specified in Table 4.

6.4 Life and Lumen Maintenance Test

6.4.1 The lamp selected for the test as in 4.4 shall be operated throughout the life test in a horizontal position at the life test voltage (dc or ac 50 Hz). Any momentary fluctuation from the test voltage during the life test shall not exceed ± 1 percent, and there shall be no sensible departure of the mean test voltage from its correct value. All lamps shall be switched off twice daily for period of not less than 15 minutes during the test if the duration of the test per day is more than 8 hours ('Daily' does not necessarily mean a day of 24 hours). A record shall be kept of the number of lamp failures and the number of hours run by each lamp before failure.

6.4.2 *Requirements for Lumens at 500 Hours* — Each lamp of the LTQ shall be tested for lumens at rated voltage at 500 ± 24 hours.

6.4.3 The life test may be considered complete when the requirements of 3.3 have been satisfied by life test quantity of lamps specified in 4.4. Any lamp or lamps accidentally broken during life test shall be omitted in calculating the results.

6.4.4 The life test may be extended, if found necessary, beyond 1 000 hours up to a maximum of 1 600 hours.

7. CONDITION OF COMPLIANCE

7.1 Individual Lamps — Any individual lamp shall be rejected if it fails to satisfy the requirements of 3.1 and 5.

7.2 Individual Packages — Any individual package shall be rejected if it fails to satisfy the requirements of 3.4.

7.3 Batches of Lamps — If any test quantity fails to satisfy any of the requirements of 7.3.1 to 7.3.3, the batch shall be rejected and no subsequent test shall be carried out from that batch.

7.3.1 Mechanical and Physical Requirements and Marking (Except Fragility of Filaments) — A batch shall be considered to comply with the requirements of 3.1 (except for fragility of filaments) and 5 if the number of lamps failing does not exceed the qualifying limits given below:

<i>Test Quantity</i>	<i>Qualifying Limit</i>
a) For any single requirement	
30-36	3
37-54	4
55-71	5

<i>Test Quantity</i>	<i>Qualifying Limit</i>
b) For all requirements taken together	
30-35	7
36-42	8
43-49	9
50-56	10
57-64	11
65-71	12

7.3.1.1 Fragility of filaments — A batch shall be considered to comply with the requirements of fragility of filament (*see 3.1.3.3*), if the number of lamps failing does not exceed the qualifying limits given below:

<i>Test Quantity</i>	<i>Qualifying Limit</i>
30-36	2
37-54	3
55-71	4

7.3.2 Initial Ratings — A batch shall be considered to comply with initial rating requirements of **3.2**, if the following conditions are satisfied:

- a) The average initial current falls within the limits specified in Table 4.
- b) The average initial lumens falls within the limits specified in Table 4, and
- c) The coefficient of variation of initial lumens is equal to or less than the value specified in Table 4.

7.3.3 A batch shall be considered as complying with life performance requirements (*see 3.3*) if:

- a) the life of the life test quantity attains the value specified in **3.3.1** subject to the allowance given in **3.3.1.1**; and
- b) the total number of lamps having lives shorter than 700 hours, together with those failing to pass the requirements of luminous flux at 500 hours for individual lamps (*see 3.3.2*), does not exceed five.

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